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PERFORMANCE OF JAPANESE QUAILS (*Cortunix cortunix japonica*) FED VARYING LEVELS OF SPENT SORGHUM RESIDUE BASED DIETS

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ABSTRACT
An eight (8) weeks trial was conducted at the Poultry Unit of the Abubakar Tafawa Balewa University, Bauchi to determine the performance of Japanese quails (*Cortunix cortunix japonica*) fed varying levels of spent sorghum residue (SSR) based diets. One hundred and seventy (170) 14 day old unsexed quail chicks were randomly allotted to five (50 dietary treatments with two (2) replicates of 17 birds per replicate in a completely randomized design. Spent sorghum residue was included at 0, 10, 20, 30 and 40% levels. Data was collected on feed intake, weight gain, feed conversion ratio, percentage hen day and egg weight. The economics of feeding SSR was also determined. The results showed that daily feed intake (17.05- 19.94g/day) and feed conversion ratio (6.73- 7.87) were significantly ($P<0.05$) influenced by the diets. Final live weight, total live weight and daily weight gain showed no significant difference across the diets. The economic analysis indicated a decrease in the cost of feed per kg gain of the diet as the SSR inclusion level increases. It was concluded that SSR can be included in the diet of Japanese quails up to 30% without any adverse effect on growth performance and economics of production.

KEYWORDS: Japanese quails, spent sorghum residue, performance, diet.

INTRODUCTION

The human population for sub-Saharan Africa has been projected at one billion by 2020 (Winrock, 1992). Nigeria is expected to contribute a major percentage of the anticipated population growth although with a present population of over 140 million (NPC, 2006). This has serious economic implication in terms of food production to feed the populace.

The importance of animal protein in both human and animal nutrition cannot be overemphasised. Over the years, there has been a significant gap between the production and supply of animal protein to feed the ever growing population. To halt this negative trend, efforts are been directed towards boosting the livestock industry with micro-livestock having prolific tendency, short gestation period, short generation interval and rapid growth (Owen and Amakiri, 2010).

Among the micro-livestock animals is the Japanese quail (*Cortunix cortunix japonica)*. Japanese quails are hardy birds that thrive in small cages and cheap to produce. They have less feed requirement of about 20- 25g feed per day compared to chicken that requires 120 -130g per day (Ani *et al*., 2009). The Japanese quail attains market weight of 140 -180g between 5- 8 weeks of age and, a high rate of egg production between 180- 250 (Garwood and Diehl, 1987; Shwartz and Allen, 1981) and 200- 300 eggs in their first year of lay (NRC, 1991).

This study was therefore design to assess the performance of Japanese quails fed varying levels of spent sorghum residue (SSR) based diets.

MATERIALS AND METHODS

Study area:

The study was carried out at the Poultry Unit of the Abubakar Tafawa Balewa University, Bauchi, Nigeria between November 2009 and January, 2010.

Bauchi State is located in the North-eastern sub-region of Nigeria. The State is between latitude 10^{o} 17 North and longitude 9^{o} 49 East, at an altitude of 690.2m above sea level. The area experiences 5 and 7 months of rainy

and dry season respectively. The rain falls between May and September, and dry season between October and April. The vegetation of the area is made up of open savannah woodland with trees up to 6m or more occurring singly or in clusters.

Experimental animals and their management:
Japanese quail chicks, two (2) weeks old, totalling 170 chicks were allotted to five (5) dietary treatments with two (2) replicates of 17 birds per replicate in a completely randomized design. The chicks were allowed to adapt to the experimental diet for 14 days which was followed by a growth study for 8 weeks.

Data was collected on feed intake and weekly body weight changes. Hen day egg production and economics of feeding spent sorghum residue to the birds was also determined. Mortality was also recorded throughout the period of the study.

Experimental diet:
Five (5) iso-nitrogenous diets containing 23% crude protein (CP) for the starter phase (0- 4 weeks) and, 20% CP for the finisher phase (5- 8 weeks) were formulated in which spent sorghum residue replaced maize at 0, 10, 20, 30 and 40% respectively. The other ingredients used in formulating the diet were soyabeans meal, fish meal, maize offal, mineral and vitamin premixes. The percentage composition of the ingredients at both the starter and finisher phases are shown in Tables 2 and 3 respectively.

Chemical composition;
The proximate composition of spent sorghum residue for dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE) and ash were determined according to AOAC (1990). Calcium (Ca) was determined by atomic absorption spectrophotometer and phosphorus (P) analysed by Technicon II Auto analyser, which is based on calorimetric method.

Statistical analysis
Data collected was subjected to analysis of variance (ANOVA) according to Steel and Torrie (1980). Where significant differences exist between means, Duncan's multiple range test (DMRT) was used to separate the means (Duncan, 1955).

RESULTS
The effect of varying levels of spent sorghum residue (SSR) on the performance of the quails is shown in Table 4. The daily feed intake (DFI) which ranges between 17.35- 19.94g/bird was significantly ($P<0.05$) influenced by dietary treatments. Birds on the control diet (0% SSR) recorded the lowest DFI whilst birds on 30% SSR had the highest DFI value (19.94g/bird/day).

The final live weight (FLW), total live weight (TLW) and daily weight gain (DWG) were not affected by dietary treatments. The values ranged from 160.4- 170.3g/bird, 138.04- 147.0g/bird and 2.47- 2.63g/bird for FLW, TLW and DWG respectively.

The feed conversion ratio (FCR) of the quails showed significant ($P<0.05$) differences between treatments. The lowest (6.73) FCR was recorded by quails on the control diet (0% SSR). Quails on diets C (20% SSR), D (30% SSR) and E (40% SSR) recorded similar FCR values; 7.76, 7.60 and 7.87 respectively.

The early lay characteristics in terms of mean hen day egg production, average egg weight and economics of feeding quails with SSR is shown in Table 5. The average hen day egg production was 66.16, 58.41, 69.23, 64.58 and 57.42% for diets A, B, C, D and E respectively. Quails on diet C (20% SSR) recorded the highest hen day egg production (69.23%) compared to the other treatments. However, the hen day egg production was not influenced by dietary treatments. Similarly, average egg weight which ranged from 9.07 to 9.14g was not affected by treatments.

The economic analysis indicated a gradual decrease in the kilogram (kg) price of SSR compounded diet as the inclusion level increases. While the control diet (0% SSR) indicated that a kg of the diet cost ₦58.75, the same kg diet using SSR cost ₦54.17, 47.29, 45.63 and 42.50 for diets B (10% SSR), C (20% SSR), D (30% SSR) and E (40% SSR) respectively.

As the level of SSR inclusion in the diet increases, the feed cost in naira (₦) per kg gain per bird (₦/kg gain/bird) decreased. The values were between ₦46.33 and N56.99 across dietary treatments. The feed cost in naira (₦) per kg gain (₦/kg gain) which was between ₦335.72 and ₦395.76 across dietary treatments also favoured the use of SSR compared to the sloe maize diet.

DISCUSSION

The results of the feed intake observed in this study showed an increase with increase spent sorghum residue (SSR) inclusion in the diet. This result agrees with earlier reports (Uchegbu and Udebidie, 1996) who obtained increased level of intake with increased level of SSR up to 40% in broiler-finisher diet. This could be attributed to the less fibrous nature (16.55% CF) of the SSR in addition to its relatively high crude protein content (21.88% CP). Table 1.

The final live weight (FLW) though not influenced by dietary treatment, showed a gradual increase from 10% to 30% SSR level of inclusion. This indicates that Japanese quails can efficiently utilize SSR at up to 30% level of inclusion without compromising final live weight.

The daily weight gain (DWG) of the Japanese quails was not significant across dietary treatments. However, quails on 30% SSR recorded the highest DWG (2.63g/bird/day). This further confirms that the birds can tolerate SSR at up to 30% level of inclusion without adverse effect on their daily gain.

The feed conversion ratio (FCR) though quite variable across the diets, was better for the control diet and, the 10% and 30% SSR diets were similar to the control diet. This report confirms earlier observations (Bello, 1984; Shim and Vohra, 1984) of lower values of FCR for broiler chickens fed SSR at lesser inclusion levels of 10%.

The Japanese quails in this study came into lay at an early age (5 weeks) with an average egg weight of 9.10g compared to 10- 13 weeks earlier reported (Thear and Fraser, 1986). Breed and species differences as well as good quality feed could be responsible for such disparity.

The hen day egg production which was between 57.42- 69.23% is quite high compared to that reported (30.28-36.39%) earlier (Babangida and Ubosi, 2006). This could be due to the high percent crude protein (24% and 20% for starter and finisher respectively) compared to between 16-22% CP levels of the diet used.

The egg weight in the present study (between 9.07-9.14g) compares favourably with the result of Babangida and Ubosi (2006) who recorded 9.51g egg weight when quails were fed 20% CP diet which was not significantly different from birds fed 22% CP (10.13g). This shows that at 20% CP, egg weight of quails is not compromised.

The economic analysis of SSR compounded diets indicated a decrease in the cost of feed per kilogram of the diet as the SSR level of inclusion increases. This observation agrees with earlier reports (Vohra *et al*., 1979; Zelenka *et al*., 1984) that 40% maize can be replaced with SSR in layers diet and its availability also contribute to its relative cheap price.

CONCLUSION

From the result obtained, it can be inferred that dietary inclusion of spent sorghum residue up to 30% is comparable in performance with the control diet. The final live weight and daily weight gain of the quails fed 30% SSR was better than the control diet (0% SSR) while, the feed conversion ratios were similar. Feed cost (₦/kg gain) was higher for the control diet than the 30% SSR diet. It can be concluded that SSR can be included up to 30% in diet of Japanese quails without any adverse effect on growth performance and economics of production.

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Table 1: Proximate composition (%DM basis) of spent sorghum residue (SSR).

Parameters	Spent sorghum residue
Dry matter	94.33
Crude protein	21.88
Crude fibre	16.55
Nitrogen free extract	49.18
Ether extract	6.73
Ash	5.10
ME/Kcal/kg	3426.85
Phosphorus	1.40
Calcium	0.51

Table 2: Ingredient inclusion (%) of starter ration fed to quails.

Ingredients	Experimental diets				
	A	B	C	D	E
Maize	46.08	42.10	38.10	34.10	30.10
Soyabeans	34.72	28.70	22.70	16.70	10.70
Maize offal	10	10	10	10	10
Fish meal	5	5	5	5	5
SSR	0	10	20	30	40
Lime stone	1.5	1.5	1.5	1.5	1.5
Bone meal	2	2	2	2	2
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.1	0.1	0.1	0.1	0.1
Lysine	0.1	0.1	0.1	0.1	0.1
TOTAL	100	100	100	100	100
Calculated analysis (%)					
Crude protein	24.15	24.15	24.13	24.15	24.15
Crude fibre	4.40	5.71	7.00	8.30	9.10
ME(Kcal/kg)	2588.38	2571.47	2552.47	2535.21	2554.10

SSR= Spent sorghum residue.

Table 3: Ingredient inclusion (%) of finisher ration fed to quails.

Ingredients	Experimental diets				
	A	B	C	D	E
Maize	56.10	52.06	48.07	44.06	40.07
Soyabeans	24.70	18.74	12.73	6.74	0.73
Maize offal	10	10	10	10	10
Fish meal	5	5	5	5	5
SSR	0	10	20	30	40
Lime stone	1.5	1.5	1.5	1.5	1.5
Bone meal	2	2	2	2	2
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.1	0.1	0.1	0.1	0.1
Lysine	0.1	0.10	0.1	0.1	0.1
TOTAL	100	100	100	100	100
Calculated analysis					
Crude protein	20.15	50.15	20.15	20.16	20.15
Crude fibre	4.07	5.42	6.71	8.02	9.11
ME(Kcal/kg)	2634	2616.68	2598.60	2581.16	2512.12

SSR= Spent sorghum residue

Table 4: Feed intake and growth performance of quails fed varying levels of spent sorghum residue

Parameters	Experimental diets					SEM	LS
	A	B	C	D	E		
DFI(g)	17.35[b]	18.17[b]	19.75[a]	19.94[a]	19.40[a]	0.017	*
ILW(g)	21.70	21.90	23.00	22.40	23.30	-	-
FLW(g)	166.60	164.50	165.30	170.30	160.40	10.19	NS
TLW(g)	144.48	143.08	142.52	147.00	138.04	9.96	NS
DWG(g)	2.58	2.56	2.55	2.63	2.47	0.59	NS
FCR	6.73[b]	7.09[b]	7.75[a]	7.60[ab]	7.87[a]	0.005	**

Means within a row with different superscript are significantly different;*P<0.05;**P<0.01.
LS= Level of significant
NS= Not significant
SEM= Standard error of mean
DFI= Daily feed intake
ILW= Initial live weight
FLW= Final live weight
TLW= Total live weight
DWG= daily weight gain
FCR= Feed conversion ratio

Table 5: Hen day, egg weight and economics of feeding spent sorghum residue based diets to quails.

Parameters	Experimental diet					SEM
	A	B	C	D	E	
Hen day (%)	66.16	58.41	69.23	64.58	57.42	0.32
Egg weight(g)	9.10	9.09	9.07	9.10	9.14	0.96
Economic analysis						
TFI (kg)	0.97	1.01	1.11	1.12	1.09	-
Feed cost (N/kg)	58.75	54.17	47.29	45.63	42.50	-
Feed cost (N/kg gain/bird)	56.99	54.71	52.49	51.11	56.33	-
Feed cost (N/kg gain)	395.76	382.59	367.06	347.90	335.72	-

SEM= Standard error of mean
TFI= Total feed intake

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